ELECTROCHEMISTRY OF Ag^+ AND Cu^{2+} ION EXCHANGED MORDENITES WITH VARIABLE SiO_2/Al_2O_3 MOLAR RATIO.

A. Cervantes[1], I. Gonzales[2], V. Petranovskii[3]
[1]Departamento de Química de la Universidad Autónoma de Puebla, México.
[2]UAM-Iztapalapa. Departamento de Química, México, D.F., 09340 México
[3]Centro de Ciencias de la Materia Condensada, UNAM, Ensenada, B.C., México.

In the last decades considerable advances were made in the investigation of electrodes modified with zeolites, in spite of the fact that the zeolites are insulators. The electrochemical activity was demonstrated for several kinds of cations incorporated in different zeolites. In the same time metal-loaded zeolites are promising catalysts, those activity depends on the state of active metal and their chemical composition, that is SiO_2/Al_2O_3 molar ratio (MR). Dealuminated mordenite samples in protonated forms were supplied by TOSOH Corporation, Japan, in the range of SiO_2/Al_2O_3 molar ratios (MR) from 10 to 206. Previous results revealed drastic influence of MR on reduction of mordenites samples ion-exchanged with Ag^+, Cu^{2+}, and Ni^{2+} cations [1-3]. Different kinds of clusters and nanoparticles were obtained. The aim of the present work was to study the electrochemical processes in the mordenites exchanged with Ag^+ and Cu^{2+} ions or well with different reduced metal species (clusters and nanoparticles). Mordenites with different MR in ion-exchanged and reduced in H_2 flow were used for electrode preparation. UV-Visible spectra of the reduced samples show appearance of different reduced species as a function of MR and temperature of reduction (Fig. 1). Electrochemical reduction and oxidation of electrode, containing ion-exchanged zeolite, differs from non-modified electrodes. This study demonstrates for reduced in hydrogen samples several peaks of oxidation, corresponding to different reduced species (Fig. 2). Number of peaks (i.e. number of different nano-species) varies for different MR.

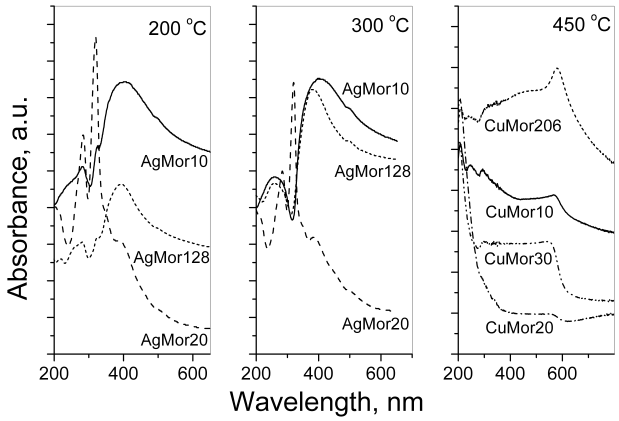

Fig. 1. Spectra of Ag^+- and Cu^{2+}-Mordenites with different SiO_2/Al_2O_3 molar ratios reduced at different temperatures.

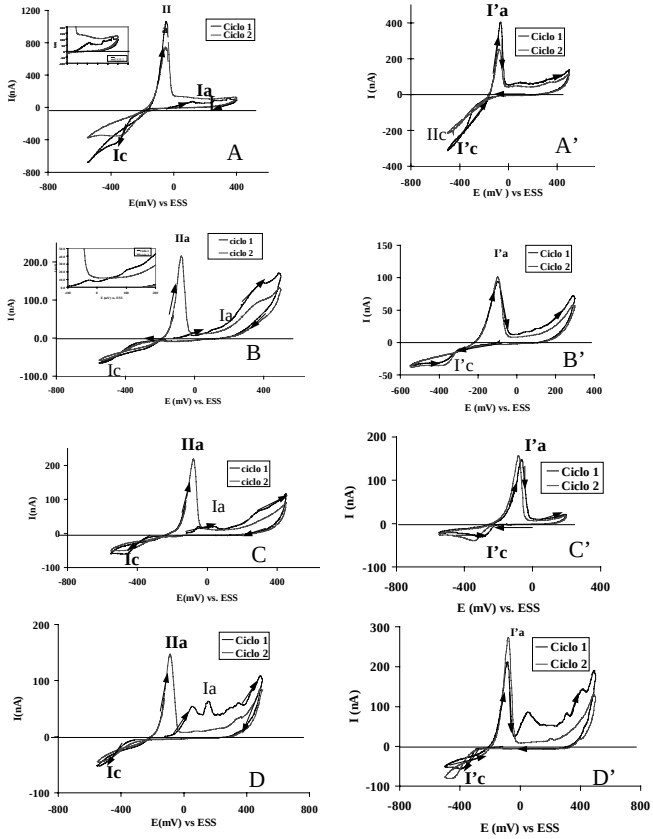

Fig. 2. Cyclic voltammograms of zeolite-containing carbon electrodes in 0.1 M $NaNO_3$ solution. A, A' (AgMor19), B, B' (AgMor10), C, C' (AgMor30) and D, D' (AgMor110) – scans in anodic and cathodic directions respectively for mordenites reduced at 200 °C.

References

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